

Increased Field Resistance to *Tilletia caries* Provided by a Specific Anti-Fungal Virus Gene in Genetically Engineered Wheat

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Abstract: Field performance of two Swiss wheat (*Triticum aestivum*) varieties expressing a specific viral gene (KP4) showed 10% increase in fungal resistance against *Tilletia caries* (stinking smut) under high infection pressure (SCHLAICH *et al.* 2006, Plant Biotechnology Journal, 4: 63–76). To our best knowledge, this is the first report of improved resistance against any fungus in wheat achieved by genetic engineering. In the greenhouse, the genetically modified wheat lines previously showed up to 30% reduction in symptoms after *T. caries* infection (CLAUSEN *et al.* 2000, Nature Biotechnology, 18: 446–449) depending on the fungal strain used for inoculation. A greenhouse experiment performed in parallel with the field test and using the same collection of *T. caries* confirmed these results. The KP4 transgene behaved as quantitative resistance locus in a dose-response experiment with isolated fungal strains. Variation of the infection pressure using increasing spore concentrations shifted the S-shaped dose-response curve towards a higher resistance response. The KP4-mediated resistance response was highly specific for fungi of the order *Ustilaginales*. Assays to test the effect of the KP4 transgene expressed in wheat by exposing cultured mammalian cells, including hamster and human, to the viral protein showed no significant effects based on stringent biosafety criteria. Using the Barley1 Affymetrix GeneChip® and confirmation by real time-PCR showed that endogenous pathogen-related genes were also activated after fungal infection in the presence of the KP4 transgene.

Keywords: wheat; varieties; KP4; resistance; genetic engineering